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PSEUDOMASARIS MARGINALIS NESTING IN LOGS IN COLORADO (HYMENOPTERA: MASARIDAE)

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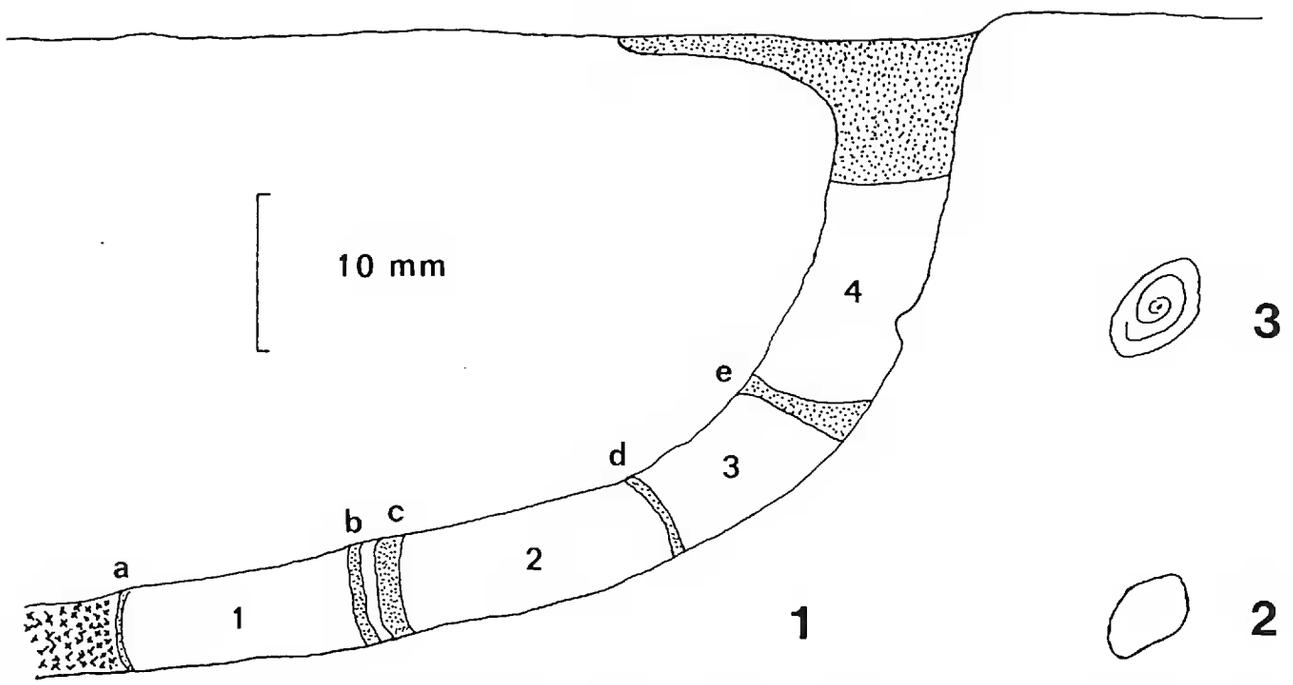
Pseudomasaris wasps have attracted attention because of their pollen collecting activities. Nevertheless, information concerning the nesting biology of most of the 15 species of *Pseudomasaris* recognized by Richards (1963) is sparse. Mud nests attached to rocks have been described for *P. coquilletti* Rohwer (Richards, 1963), *P. occidentalis* (Cresson) (Hungerford, 1937), *P. phaceliae* Rohwer, *P. zonalis* (Cresson) and *P. maculifrons* (Fox) (Parker, 1967). Similar mud nests attached to plant stems are known for *P. texanus* (Cresson) (Bequaert, 1940). Two species, *P. edwardsii* (Cresson) and *P. vespoides* (Cresson), also construct mud nests, but attach them to either plant stems or rocks (Davidson, 1913; Cockerell, 1913; Hicks, 1927, 1929, 1931; Torchio, 1970). We here report the discovery of yet a third type of nest substrate: abandoned beetle tunnels in logs which are used by *P. marginalis* (Cresson). This appears to be the first report of a nest substrate of this type in the Masaridae.

Nest Site

On 11 July 1980 a female of *P. marginalis* was observed entering and exiting an abandoned beetle tunnel in a fallen bristlecone pine (*Pinus aristata* Engelmann) log. The log was located at timberline (3550 m elevation) on the southeastern side of Pennsylvania Mountain, west of Fairplay, Park County, Colorado. It was oriented so that the nest entrance was on the upper surface of the log approximately 5 dm above the ground. When the nest was reexamined on 14 July 1980 the entrance had been sealed with mud.

Nest Architecture

Upon opening the nest in mid August 1980, it was found to consist of a linear series of four cells (Fig. 1). The nest occupied the initial curved 60 mm of the beetle tunnel; the distal portions of the tunnel being filled with sawdust. The two innermost cells contained prepupae with their heads oriented toward the nest entrance, while the two outer cells were empty. The innermost cell (Fig. 1) was lined at the bottom with a thin layer of mud which abutted the sawdust left in the tunnel by the beetle (Fig. 1, a). The



Figs. 1–3. Nest of *Pseudomasaris marginalis*. Fig. 1. Lateral section through nest showing the orientation of the four cells. The cells are numbered 1 through 4. The partitions are labelled a, b, c, d and e. Fig. 2. Outline of cross section through cell number one. Fig. 3. Spiral closing, lower surface of partition e which separates cells three and four.

top of this cell was closed with a thin, 0.9 mm thick, mud plug (Fig. 1, b). This cell was 11.2 mm long and 3.9 mm wide and as with all the other cells it was somewhat flattened in cross section (Fig. 2) because the beetle tunnel itself was flattened in cross section.

There was a small space between the closing of the lowermost cell and the base of the next cell. The mud base of this second cell (Fig. 1, c) was 2.1 mm thick and slightly depressed in the center. This second cell was 10.1 mm long and 4.3 mm wide. The mud partition separating the second and third cells (Fig. 1, d) was 0.4 mm thick and the mud extended along the cell walls several mm below the partition.

The third cell was empty, containing no signs of provisions, feces or any other indication of occupation or use. This was the shortest cell, 8.2 mm long and 4.0 mm wide. It was separated from the fourth cell by a 1.5 mm thick partition (Fig. 1, e) which had an obscure spiral pattern on its inner surface (Fig. 3). This closure might alternatively be considered to be formed of three uneven concentric circles.

The fourth cell was also empty. There was a suggestion of an incomplete partition halfway up the cell. This cell was 13.0 mm long and 4.4 mm wide. It was capped by the nest closing, which had a nipple at its base. Cells three and four appeared to have a thin lining of mud while cells one and two lacked this lining.

The nest closing was not flush with the wood surface, but was slightly

depressed in the center. It was made of the same fine grained, very hard clay as were the other mud partitions and was 9.9 mm thick. At the surface the nest closing was 11.4 mm long and 10.5 mm wide, but it tapered toward the top of cell four.

Provisions

Grains of *Phacelia sericea* A. Gray pollen were found adjacent to the cocoon in cell two. Adult females of *Pseudomasaris marginalis* were collected on Pennsylvania Mountain in July and August foraging on *Phacelia sericea* at 3550 and 3660 m elevations. A single male was also taken on Pennsylvania Mountain in late June on *Polemonium delicatum* Rydberg at approximately 3500 m elevation.

Cocoons

Cells one and two were lined with transparent cocoons. These cocoons consisted of fine threads and a matrix of very thin sheet-like material, the thickness of the cocoon lining varying considerably. For the most part, it was very thin, strictly adhering to the cell walls. Where the cocoons abutted the wood substrate, they frequently did not form a complete layer. Elsewhere cocoon linings were thicker, forming complete sheets and they were readily extractible from the cell walls. This latter pattern was most evident on the lateral sections of cocoons in the posterior portion of the first cell and the anterior portion of the second cell.

Feces

The bottom of the innermost cell was covered with a grey excretory mass and that of the second cell with a greyish-green excretory mass that was similar to the first in texture. Small, hard, shiny black fecal pellets were in the outer lining of the cocoon and adjacent to the cocoon in the basal part of cell one and the anterior portion of cell two. These pellets were from 0.9 to 1.0 mm in length and 0.5 to 0.6 mm in width.

Parasites

No parasites were present in the nest.

Discussion

The most detailed report on the nesting biology of a *Pseudomasaris* wasp is that of Torchio (1970) for *P. edwardsii*. While the principal difference between our report and that of Torchio (1970) concerns the nest substrate chosen by the wasps, the nest of *P. marginalis* also differs from the nests of *P. edwardsii* in a few other aspects.

The cells of the *P. marginalis* nest are in a linear series. This is undoubtedly due to the constraints imposed by the form of the beetle burrow. Tor-

chio (1970) noted that generally cells of *P. edwardsii* nests are joined along their lateral margins although he did observe one nest placed in a long narrow groove in which the cells were arranged in a linear series.

The outermost two cells in the *P. marginalis* nest are empty. Torchio does not report empty cells for *P. edwardsii* nests, but empty cells are apparently common in nests of *P. vespoides* (Tepedino et al., 1979). The latter suggest that these empty cells may represent a defense against parasitism, but such explanations are questioned by Krombein (1967).

The cocoons of the *P. marginalis* larvae appear to be essentially similar to those described for *P. edwardsii.* The nature of the feces differ, however. Whereas the feces of *P. marginalis* are individual pellets, those of *P. edwardsii* are aggregated into fecal cakes (Torchio, 1970).

Finally, although the cells in the *P. marginalis* nest we examined are represented by soil partitions and wooden walls, other *Pseudomasaris* construct complete soil cells in which both the cell cap and walls are made of mud (Torchio, 1970). Torchio (1970) reports that the cell closures of *P. edwardsii* cells are formed by smooth concentric circles of mud. The caps of the two empty cells of our *P. marginalis* nest are definitely nippled on their inner surfaces and appear to have a spiral structure. The inner surfaces of the cell caps of the provisioned cells are relatively smooth with the fine structure obscured by the closely adhering cocoons. It is not clear if this is a real difference between the taxa or an artifact due to the absence of empty cells in *P. edwardsii* nests.

While our report is the first concerning the use of a beetle burrow in wood as a nest by any species of *Pseudomasaris,* the nest we describe does not, as we have indicated, represent a radical departure from the type of nests previously described. It does suggest that there is more variation within the genus than previous reports have suggested. It would be of interest to know if this use of beetle tunnels is typical of all *P. marginalis* and if similar nests are constructed by *P. macneilli* R. M. Bohart, an apparently closely related species of high altitudes in California and Utah.

Acknowledgments

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Literature Cited

Bequaert, J. 1940. Notes on the distribution of *Pseudomasaris* and on the foodplants of the Masaridinae and Gayellinae. Bull. Brooklyn Entomol. Soc., 35:37–45.

Cockerell, T. D. A. 1913. *Pseudomasaris* bred in California. Proc. Entomol. Soc. Wash., 15:107.

Davidson, A. 1913. *Masaria vespoides*. Bull. Southern Calif. Acad. Sci., 12:17–18.

Hicks, C. H. 1927. *Pseudomasaris vespoides* (Cresson), a pollen provisioning wasp. Can. Entomol., 59:75–79.

Hicks, C. H. 1929. *Pseudomasaris edwardsii* Cresson, another pollen provisioning wasp, with further notes on *P. vespoides* (Cresson). Can. Entomol., 61:122–125.

Hicks, C. H. 1931. Notes on pollen-user wasp, *Pseudomasaris edwardsii* Cresson. Bull. Southern Calif. Acad. Sci., 30:23–29.

Hungerford, H. B. 1937. *Pseudomasaris occidentalis* (Cresson) in Kansas (Hymenoptera—Vespidae). J. Kansas Entomol. Soc., 10:133–134.

Krombein, K. V. 1967. Trap-nesting wasps and bees: Life histories, nests, and associates. Smithsonian Press, Washington, D.C., 570 pp.

Parker, F. D. 1967. Notes on the nests of three species of *Pseudomasaris* Ashmead (Hymenoptera: Masaridae). Pan-Pac. Entomol., 43:213–216.

Richards, O. W. 1963. The species of *Pseudomasaris* Ashmead. Univ. Calif. Publ. Entomol., 27:283–310.

Tepedino, V. J., L. L. McDonald, and R. Rothwell. 1979. Defense against parasitization in mud-nesting Hymenoptera: Can empty cells increase net reproductive output? Behav. Ecol. Sociobiol., 6:99–104.

Torchio, P. F. 1970. The ethology of the wasp, *Pseudomasaris edwardsii* (Cresson) and a description of the immature forms (Hymenoptera: Vespoidea, Masaridae). Los Angeles Co. Mus. Nat. Hist. Contrib. Sci. No. 202, 32 pp.